Genetic evaluation of calving ease for Walloon Holstein dairy cattle

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Introduction

- Calving complications
  - impact production, fertility, cow and calf morbidity/mortality
  - decrease economic profitability of dairy herds
  - compromise animal welfare and consumer vision

➔ Need to reduce calving complications through animal breeding

Calving Ease Data

- Recorded by breeders on voluntary basis
- Collected by the Walloon Breeding Association (AWE) since 2000
- Calving Ease definition
  - Reported on a four-category scale:
    1. Caesarean and embryotomy
    2. Hard pull
    3. Easy pull
    4. Normal

Data and Edits

- Over 138,000 calving records since 2000
- Limited to 1st – 5th parities
- Holstein calves with known dam
- Single births only
- Age of dam at calving:
  - Application of specific 'parity' limits
- Required SD for CE scores ≥ 0.05 for a given herd
- For every herd-year ≥ 4 calving records required (based on the first two parities)

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➔ 85,118 CE records extracted

For (Co)Variance Estimation (VCE)

- Some additional data requirements
- Calves with dam and sire known
- Dams with a CE record in 1st parity
- Only CE data from continuous calvings per dam
- For every herd-year ≥ 4 calving records required (based on the first parity only)
- Herds needed > 1 calving per dam on average

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➔ 33,155 CE records extracted for genetic parameters estimation

Distribution of Calving Ease Scores

	Full dataset (N=85,118)	VC & Parameters Estimation dataset (N=33,155)
1. Caesarean & embryotomy	0.9%	1.3%
2. Hard pull	4.7%	6.6%
3. Easy pull	27.6%	30.5%
4. Normal	66.8%	61.6%

Model Definition

- Univariate Linear Animal model
- Fixed effects:
  - Season (4 classes)
  - Herd
  - Sex of calf * age of dam classes (11 classes) * group of parities (2 classes)
- Random effects:
  - Herd * year of calving
  - Direct and maternal additive genetic
  - Permanent maternal environmental
- Unexplained residual

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With genetic correlation
➔ Model L1

Without genetic correlation
➔ Model L2

VC and Parameters Estimates

- VC were estimated by Gibbs sampling (GIBBS2F90 by S. Tsuruta)

	Model L1		Model L2	
Parameter	PM	PSD	PM	PSD
$\sigma^2_{herd *year calving}$	.042	.002	.042	.002
σ^2_{direct}	.027	.004	.028	.004
$\sigma^2_{maternal}$	.008	.003	.009	.002
$\sigma^2_{maternal env.}$	.018	.004	.017	.005
$\sigma^2_{residual}$	.269	.005	.269	.005
r(d,m)	.088	.194	n/a	n/a
h^2 direct	.074	.012	.078	.012
h^2 maternal	.023	.007	.024	.007

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Permanent environmental effects = 5% of phenotypic variance
Herd*year of calving effects = 12% of phenotypic variance
Residual effects = 74% of phenotypic variance

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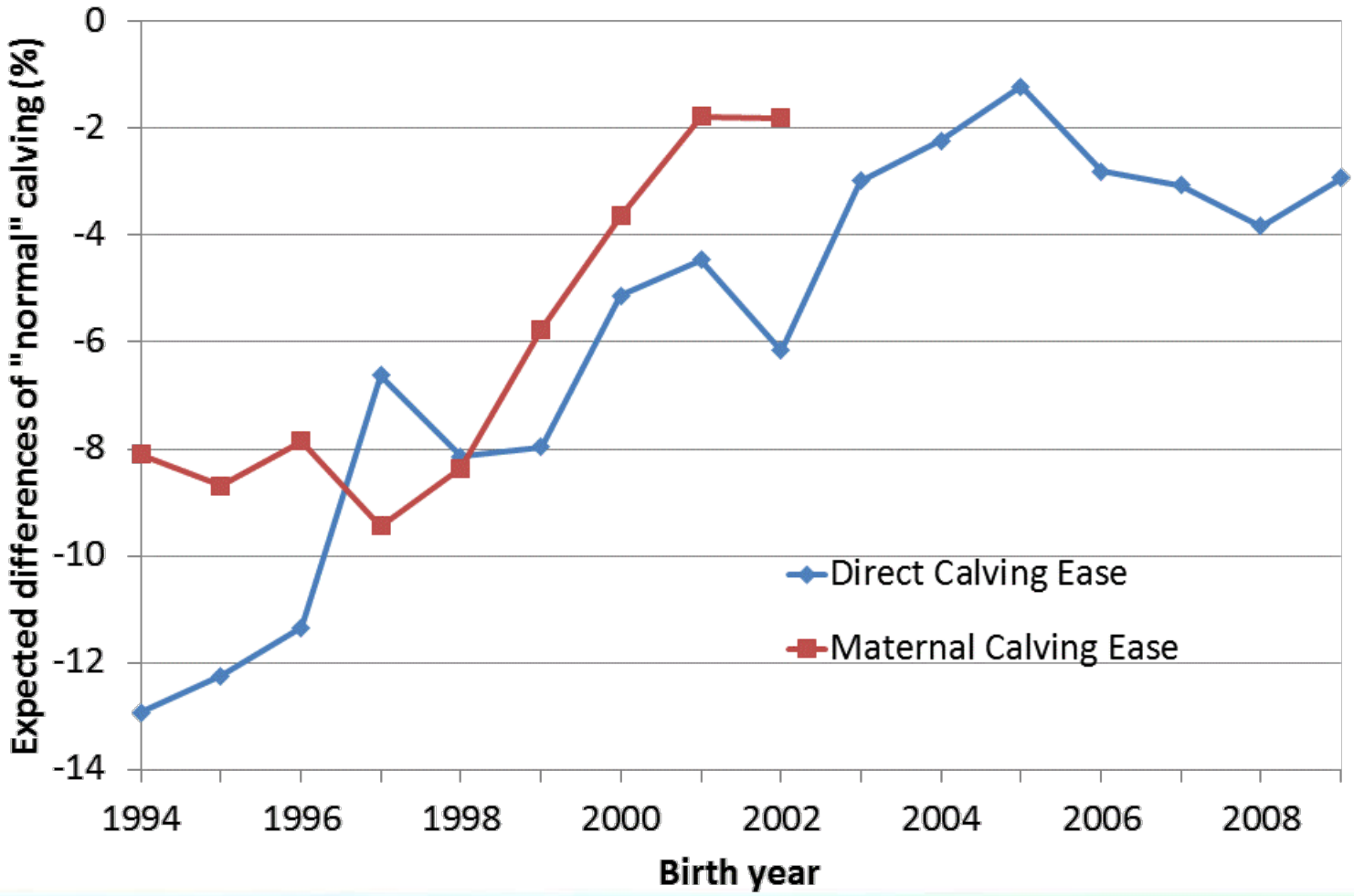
Genetic Evaluation System

- Model L2 with full dataset
- Evaluations converted to expected differences in percentage of « normal » calving (scored 4)
- Genetic Base: Cows born in 2005
- Validation of Model L2 during the Interbull test-run of January 2013
- Genetic correlations with other countries:
  - .52 - .73 for direct CE
  - .56 - .75 for maternal CE

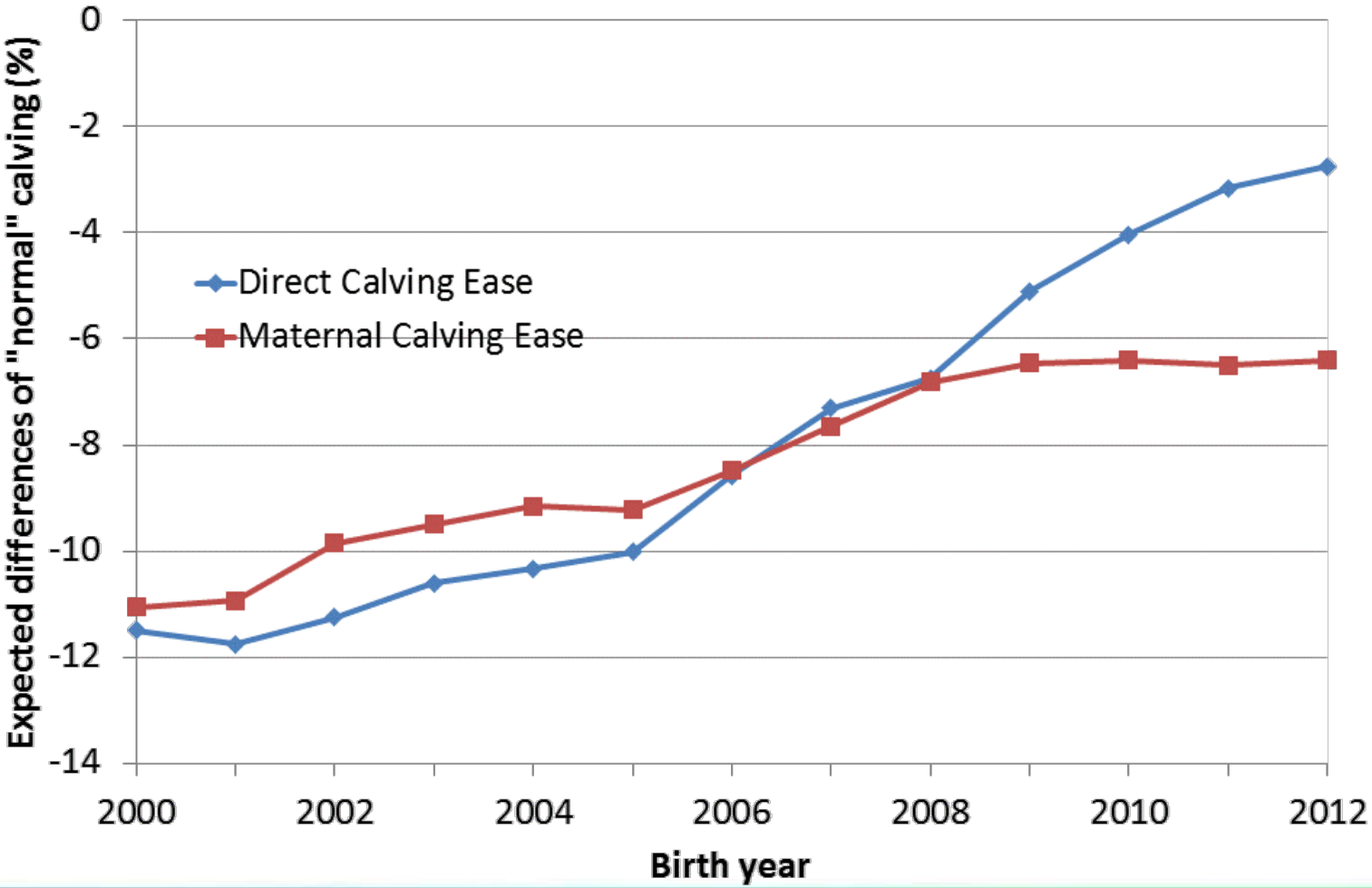
Genetic Trend for Calving Ease

- Holstein bulls with REL ≥ 35%



Genetic Trend for Calving Ease

- Holstein cows and calves with REL ≥ 15%



Conclusions

- No relevant genetic correlation between direct and maternal effects
- Direct h^2 of 8 %
- Maternal h^2 of 2%
- CE breeding values converted to expected differences in percentage of « normal » calving (scored 4)
- Model L2 for Walloon Holstein implemented in routine in April 2013
- First release to our breeders planned in next weeks

Thank you for your attention!

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